PRICING CONSERVATISM

AN EMPIRICAL STUDY ON THE VALUE RELEVANCE OF CONSERVATIVE RESERVES IN SWEDISH FIRMS

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Title: Subtitle

Abstract:

The purpose of this study is to evaluate the financial market's efficiency in respect to conservative accounting. Particularly the study focuses on conservative accounting's influence on the reported return on owners' equity, including the influence of build-ups and realizations of conservative reserves. This is accomplished by proposing a measure of an unbiased return on owner's equity that is unaffected by conservative accounting, and subsequently acts as the basis for establishing stock-picking strategies that are evaluated in a market setting. The unbiased return on owners' equity is obtained by estimating a conservative reserve ratio that reflects unrecorded reserves for long-lived depreciable assets, research and development expenses, inventories and deferred taxes for each individual firm and year. The stock-picking strategies generate annual buy and sell signals on Swedish listed firms in the fiscal years 2003-2014, which are evaluated together as portfolios over 36-month periods. The results of the study imply that the market cannot be assumed to be inefficient in respect to conservative accounting's influence on the reported return on owners' equity. This largely contradicts previous, limited, research on the topic and suggests that considerations regarding conservative accounting have become less value relevant over time.

Keywords:

Abnormal return, Conservative accounting, Conservative reserves, Conservative reserve ratio, Market Efficiency

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1. Introduction

Historically, financial reporting standards have been guided by the *conservatism* principle, which seeks a *prudent* reaction to uncertainty to try to ensure that uncertainty and risks inherent in business situations are adequately considered (FASB, 1980). In 2010, FASB stopped promoting the use of the words prudence and conservatism and stated that understating assets or overstating liabilities in one period frequently leads to overstating financial performance in later periods, the opposite of what can be viewed as prudent or neutral (FASB, 2010). Instead, standard setters now promote the purpose of financial statements as to provide information about a company's financial position, financial performance, and cash flows that is *useful* to users in making economic decisions (IASB's Conceptual Framework, 2015). In a quest for usefulness, accountants should seek to maximize relevant and faithfully representation. In 2015 however, IASB reintroduced the concept of prudence within the context of faithfulness and neutrality, as a characterizing trait for exercising of caution when making judgments under conditions of uncertainty (IASB Conceptual Framework 2.16, 2015).

While IFRS and FASB no longer actively promote conservative accounting, financial statements are still not expected to be free from conservative bias (Barker, 2015). This conservative bias causes book values of net assets to be understated on average (Feltham and Ohlson, 1995). Understating the value assets creates unrecorded reserves, which can be used to realize future income for the company (Penman and Zhang, 2002). A typical source of such reserves is the accounting for intangible assets, such as R&D and brand investments. These may only be recognized under certain criteria and are often understated or omitted completely (Penman, 2013; IASB, 2020, IAS38 para. 10). Another source is long-lived assets, which become understated as firms mismatch cash flows with depreciation, underestimate their economic lives, and disregard the effects of inflation (Runsten, 1998).

In addition to the reported value of equity being understated, conservative accounting also causes reported net income to be understated when firms grow (Zhang, 2000; Beaver and Ryan, 2000). While conservative accounting could pose problems in a valuation setting, lower levels of current book values are in an accounting-based valuation model offset by higher levels of future residual income (Penman, 2013). As such, the value of a firm is theoretically unaffected by the firm's accounting choices (Penman, 2013). However, as both net income and return on owners' equity may be positively influenced by sudden realizations of conservative reserves (Penman and Zhang, 2002), market participants must be able to correctly interpret firms' discretion in their application of conservative accounting. According to the efficient market hypothesis, a better alignment of accounting standards to underlying economics would have no impact as such information can be inferred through the already disclosed information (Fama, 1970). On the other hand, correct interpretations of the true profitability in the presence of conservative accounting require extensive knowledge and data analysis, which arguably cannot be expected of the average market participant (Grossman and Stiglitz, 1980). Hence, it is relevant to further evaluate how the market acts in relation to the existence of the conservative measurement bias in accounting.

While the existence and theoretical implications of conservative accounting is widely documented, limited efforts have been put into examining it empirically. Likewise, the extent to which the market understands and efficiently treats the occurrence of conservative accounting is not widely established, thus motivating further investigation on the topic. This thesis aims to empirically investigate whether an investor can use publicly available accounting information to outperform the market. More specifically, it considers the effect of conservative measurement of net assets and evaluates whether market prices incorporate the effect of the bias of the return on owners' equity that occurs due to accounting conservatism.

The remainder of the paper is structured as follows: Section 2 summarizes relevant literature including how the topic relates to research about market efficiency, a background on conservative accounting and a summary of relevant study design considerations. Section 3 explains the methodology, including the measurement of conservative reserves, formulation of stock picking strategies, composition of portfolio strategies and statistical analyses. Section 4 explains considerations regarding the sample of the study and Section 5 outlines the results. Finally, Section 6 discusses the implications and limitations of the study's findings.

2. Literature Review

The literature review aims to give the author insights into the considerations regarding the concept of conservative accounting, its valuation implications and how potential new insights might affect market prices.

2.1. Background on the Efficiency of Markets

The debate regarding the efficient market hypothesis (EMH) is divided and inconclusive. First defined by Fama (1970), the EMH is typically divided into the weak, semi-strong and strong forms. The weak form assumes efficiency in respect to historical prices, the semi-strong form efficiency in respect to all publicly available information and the strong form implies that market prices reflect all available information, public and private. Proponents of the EMH, such as Fama (1970), argues that it holds in the semi-strong form but that the strong form is more theoretical and should rather be viewed as a benchmark for perfect markets. A common illustration of how EMH holds on the semi-strong level is the consistent underperformance of actively managed mutual funds where active decision making on average decreases the returns versus the market. (Malkiel, 1989). Grossman and Stiglitz (1980) propose an alternative interpretation of the efficient market, where security prices do reflect the information of informed individuals, and that individuals who expend resources to obtain information get compensated (Grossman and Stiglitz, 1980). Malkiel (2003) argues, similar to Grossman and Stiglitz, that the market can never be completely efficient as there would then be no incentives for professionals to uncover information that serves to correct markets.

A simple illustration that contradicts the EMH in the semi-strong form is the post earnings announcement drift (PEAD). The PEAD-effect shows that a price reaction to earnings is often followed by subsequent movement in the same direction multiple days following the announcement (Bernard and Thomas, 1989), as opposed to an immediate correction which would be consistent with the EMH in the semi-strong form. While some argue this attributable to changes in riskiness of securities, Bernard and Thomas' (1989) analysis suggests that the price movement rather reflect how the market is delayed in its response to new information.

Another counterargument is how the market reacts to redistribution of already public information. One instance is the market's reaction to papers published by prominent accountant critic Abraham Brillof, who often publicly criticized individual stocks after thorough financial analysis. George Foster (1979) compiled the stock market impact of papers published by Brillof and showed that prices on average dropped by 8 percent on the day of publication and then remained persistent on these levels. Such a large move in conjunction with the distribution of already public information implies that widely available information had been disregarded or misinterpreted, both explanations being inconsistent with EMH in the semi strong firm. While one explanation is market inefficiency, another explanation is the existence of an information market, where a sophisticated participant, such as Brillof, gets compensated for his superior insights (Foster, 1979). Such an explanation would be consistent with the efficient market as defined by Grossman and Stiglitz (1980) who argue that security prices reflect information of informed individuals and that those who expend resources to obtain information receive compensation. With this definition in mind, to view the price drop following Briloff's articles as evidence that the market is inefficient, one would have to assume that his acquired information is already costlessly available to all market participants, an assumption which is highly questionable considering his superior analytical skillset (Foster, 1979).

Other proponents of the utility of ex post financial analysis are Penman and Ou (1989). The authors argue, based on empirical data, that analysis of published financial statements can give information about intrinsic value, which market prices gravitate to but not necessarily equal at all time. Abarbanell and Bushee (1998) show the usefulness of fundamental analysis, in that markets are not completely efficient in respect to information such as changes in working capital, gross margin and quality of earnings. Moreover, it is argued that prevailing abnormal returns reflects a previous underreaction to information, and as such the occurrence of abnormal returns are concentrated to future information events, such as newspaper articles and future earnings announcements.

2.2. Conservative Accounting

2.2.1. Background

The terminology regarding conservative accounting is surrounded by ambiguity. Basu (1997) defines conservatism as the accountant's tendency to recognize bad news more quickly than good news. As such, a decrease in asset values is often recognized immediately while an increase requires substantially more evidence and is thus often recognized over time. The accounting valuation literature often refers to a state of *unbiased accounting*, as when the market value of owners' equity equals the book value (assuming that no business goodwill exists) (Feltham and Ohlson, 1995; Zhang, 2000. Similarly, accounting is considered conservative when market value exceeds the book value (Feltham and Ohlson 1995; Zhang, 2000; Beaver and Ryan, 2000). Typically, the state of accounting is referred to as either unbiased or conservative (Feltham and Ohlson 1995; Zhang, 2000). Accounting may also be aggressive, where market values are inferior to book values, but this has limited occurrence and is therefore rarely an area of focus in the literature.

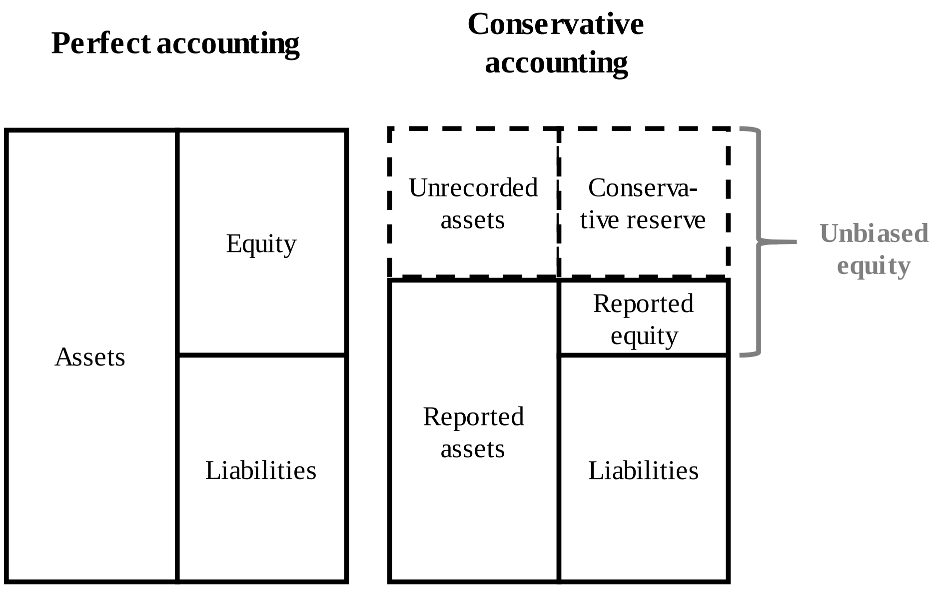
The above definitions of conservative accounting share similarities with the terminology used surrounding earnings management, a practice which has been shown to be exercised by executives through real activities manipulations (Roychowdhury, 2006). In this context, the term *aggressive accounting* is commonly used to denote instances of deliberate applications of earnings inflation through early recognition of sales and late recognition of expenses (Penman, 2013).

Penman and Zhang (2002) provides a clear definition of conservative accounting, which is the definition that will be used in this paper:

> "choosing accounting methods and estimates that keep the book values of net assets relatively low"

Figure 1 illustrates the effect of conservative accounting as opposed to perfect accounting for the balance sheet under the definition used in this study.

Figure 1. Illustration of conservative accounting



Note: Based on the definition in the accounting valuation literature. (Feltham and Ohlson 1995; Zhang, 2000; Penman and Zhang, 2002)

2.2.2. Valuation Implications

Conservative accounting causes the reported net income to deviate from the economic net income. Under the assumption of a competitive equilibrium and a constant level of growth, conservative accounting entails that earnings are less than the economic income when growth exceeds zero and that the return on owners' equity is on average greater than the cost of equity (Zhang, 2000; Beaver and Ryan, 2000) for all levels of growth. When growth is zero, accounting earnings equal economic earnings, but the biased book value produces an upwards biased return on owners' equity (Feltham and Ohlson, 1995; Beaver and Ryan, 2000). When accounting is conservative and growth exceeds the cost of equity, the reported ROE is lower than the economic return, as the impact on reported net income is greater than the impact on book value (Beaver and Ryan, 2000). Without the assumption of constant growth across all assets, year to year changes in the growth of the conservative reserve impacts net income (Penman and Zhang, 2002). As stated by Penman and Zhang (2002), when the firm increases investments, conservative accounting leads to lower reported earnings which build up unrecorded reserves. Managers can release the reserves to create additional earnings, by subsequently reducing investment or reducing the rate of growth in investment. Table 1 summarizes the impact of growth on the reported net income and reported return on owners' equity.

Table 1. Reported figures under conservative accounting at different levels of growth in the conservative reserve

$\Delta CR_t/CR_{t-1}$	Reported net income	ROE^B
< 0%	> Net income^{UB}	> ROE^{UB}
0%	= Net income^{UB}	> ROE^{UB}
0%< ΔCR_t / CR_{t-1} < ρ	< Net income^{UB}	> ROE^{UB}
= ρ	< Net income^{UB}	= ROE^{UB}
> ρ	< Net income^{UB}	< ROE^{UB}

Note: Based on relationships explained in the Beaver and Ryan (2000) applied in a similar manner as explained in Penman and Zhang (2002). CR_t represents the level of the conservative reserve (unrecorded equity) and $\Delta CR_t/CR_{t-1}$ the growth in the conservative reserve (i.e. build-up or realization). Net income^{UB} represents the economic net income produced by the unbiased return on owners' equity under perfect accounting (ROE^{UB} x (BV+CR))

The biased book values and return on owners' equity that conservative accounting creates implies that input variables in traditional valuation models will be biased. As conservative accounting causes ROE to exceed the cost of equity also when all economic residual returns have diminished, (Feltham and Ohlson, 1995; Beaver and Ryan, 2000; Zhang 2000), application of accounting based valuation models such as the RIV-model requires an estimate of a biased ROE that economically equals the cost of equity (K. Skogsvik, 1998). Skogsvik (1998) developed a residual income-based valuation model that considers the impact of conservative accounting based on a simple dividend discount valuation model.[1]

$$V_0 = BV_0 + \sum_{t=1}^{T} \frac{BV_{t-1}(r_t - \rho)}{(1+\rho)^t} + \frac{V_T - BV_T}{(1+\rho)^T} \tag{2.1}$$

[1] The model relies on the assumptions that 1) in each future accounting period, the difference between dividends being paid and new share capital being issued is adjusted in order to achieve a prespecified growth of owners' equity; 2) the investment and financing decisions of the company are such that a constant future growth of owners' equity, known to all market investors, is planned. 3) the book value of owners' equity at present is known to all market investors (=BVo).

Where

V_t = Value of owners' equity at t

BV_0 = Book value of owners' equity at t

r_t =Return on book value of owners' equity at t

ρ = equity cost of capital

In the model, the market value of owners' equity consists of the current book value, the present value of residual income until the horizon point and the present value of business goodwill/badwill at the horizon point in time. By defining a goodwill ratio, the final term in the valuation model can be reformulated as the book value of owners' equity at T adjusted for a goodwill multiplier at T.

$$V_0 = BV_0 + \sum_{t=1}^{T} \frac{BV_{t-1}(r_t - \rho)}{(1+\rho)^t} + \frac{BV_T(q_T)}{(1+\rho)^T} \tag{2.2}$$

$$q_T = \frac{V_T - BV_T}{BV_T} \tag{2.3}$$

Where q_T = goodwill ratio at T

The goodwill ratio is partly a function of the firm's business goodwill, which represents the net present value of existing investment opportunities. The other component is the conservative accounting bias (K. Skogsvik, 1998).[2]

$$q_t = q(Business\ goodwill)_t + q(Conservative\ accounting\ bias)_t \tag{2.4}$$

An implication of equation 2.4 is that as the firm's business goodwill decreases, the goodwill ratio is increasingly determined by the conservative accounting bias. Thus, when in a steady state (denoted *ss*) and a competitive equilibrium (i.e. no business goodwill), the goodwill ratio will solely be a function of the firm's accounting principles (K. Skogsvik, 1998).

$$q_{ss} = q(Conservative\ accounting\ bias)_{ss} \tag{2.5}$$

An implication of the existence of a conservative bias in the steady state is that the return on book value of owners' equity can no longer be expected to equal the cost of equity. Assuming that the expected business goodwill is zero and the expected conservative accounting bias is non-negative and constant, Skogsvik (1998) shows that the expected book return on owners' equity in a steady state may be predicted as a function of the cost of equity, the conservative accounting bias and growth (equation 2.6).

$$ROE_{ss} = \rho + q_{ss}(\rho - g_{ss}) \tag{2.6}$$

[2] Skogsvik (1998) refers to the conservative accounting bias component as the cost matching bias.

2.2.3. Empirical Findings

While the theoretical existence and implications of conservative accounting is well defined, empirical estimations of the conservative bias is limited. Lev and Sougiannis (1996) estimates the conservative reserve from R&D through capitalization of previous R&D expenses with industry-wide estimations of their useful lives. By doing so, it is shown that the annual R&D capital reserve is value relevant to investors and that the magnitude of the R&D capital reserve has a significant positive impact on future stock returns. A similar evaluation was done by Penman and Zhang (2002), who in addition to R&D, also considered conservative reserves related to the use of LIFO over FIFO, as well as brand assets. The three types of reserves were aggregated into a *conservative index*, which reflects the size of the conservative reserves in relation to net operating assets, similar to the conservative accounting bias expressed by Skogsvik (1998). The authors also evaluate their measure empirically through their *earnings quality indicator*,[3] which reflects the one-year change in the conservative index and the deviation of the conservative index from an industry median. It is shown that firms with a higher earnings quality index (i.e. firms with large expenses that expand their conservative reserves), show a more stable return on net operating assets subsequent years and that the earnings quality index has a significant positive impact on stock returns.

A comprehensive empirical study of the magnitude of the conservative bias was done by Mikael Runsten (1998) who estimated industry specific permanent measurement biases (PMB) for Swedish firms. The PMB considers a wide variety of assets, including intangible assets, assets with long economic life, and deferred taxes. By permanent, Runsten's measure refers to the bias that can be expected in a state of constant growth in book values and earnings, thus consistent with the valuation model by Skogsvik (1998). For intangible assets such as R&D, estimation is done by capitalizing expenses, while long-lived assets are adjusted to current cost through estimations of their economic life and inflation adjustments. Runsten's PMB estimates show that conservative accounting has the largest significance in the pharmaceutical industry, followed by capital-intensive services and consumer goods. Other than R&D expenses in pharmaceutical companies, deferred income taxes followed by machinery, equipment and ships are the most significant partial components to the PMBs.

2.3. Methods for Evaluating Market Efficiency

When evaluating accounting information, accounting literature often refers to the term *value relevance*. In the literature, accounting information is considered value relevant if it has a predictive association with equity market values (Barth, Beaver and Landsman,

[3] Penman and Zhang (2002) refer to the conservative index as c-value and earnings quality as q-value. It should be noted that what is referred to as c-value is what should be considered to what to the cost matching bias called q-value by Skogsvik (1998).

2001). Value relevance can be measured through the statistical relations between sets of accounting information and stock market returns (Karğın, 2013). A common and simple method to evaluate a set of information's value relevance is to compute the aggregate returns for companies in each period and record the difference between top and bottom groups in the sample through a t-test (Lev and Sougiannis, 1996; Penman and Zhang, 2002). A similar method is to evaluate portfolio returns versus the market return (S. Skogsvik, 2002; Abarbanell and Bushee, 1998) or through hedge portfolios, i.e. market neutral portfolios where stocks can be either bought or sold (Skogsvik 2002; Ou and Penman 1989). Another way to evaluate a set of information is to run a cross-sectional regression of the returns with the information variable and additional risk variables (Lev and Sougiannis, 1996; Penman and Zhang, 2002). These reference studies all apply an evaluation horizon spanning from 3 to 60 months, with all covering at least 12 months. To ensure that information has been made publicly available to investors, all studies apply a waiting period of 3 to 6 months before a position is entered into to ensure that financial information has been disclosed.

For studies evaluating portfolio returns, where the analysis produces a non-discrete variable (e.g. "score"), portfolios are entered into based on the percentile rank on that variable. Skogsvik (2002) applies a different method that produces binary buy or sell signals based on predetermined criteria, which are the basis for creating equally weighted long or short portfolios. Additionally, Skogsvik (2002) aggregates the return of portfolios for individual years to create a longer time series with more observations, offsetting possible statistical issues related to a potentially limited sample using Swedish data.

Table 2. Summary of reference studies

Paper	Research topic	Data	Evaluation	Risk controls	Time for financial disclosure	Evaluation period
Ou & Penman 1989	Financial statement analysis	US companies, 1970-1984	Portfolio buy and hold returns; portfolio hedge returns; T-test	Size-adjusted returns	3 months	3-36 months
Lev & Sougiannis 1996	Conservative reserves	US companies, 1975-1989	T-test on aggregate returns; Individual cross sectional data	Additional regression factors (CAPM-beta, size, book-to-market, leverage, earnings-price-ratio)	6 months	18 months
Abarbanell & Bushee 1998	Financial statement analysis	US companies, 1974-1993	Portfolio market adjusted buy and hold returns; T-test	Fama & French 3-factor	3 months	12-24 months
Penman & Zhang 2002	Conservative reserves, Earnings quality indicator	US companies, 1975-1997	T-test on aggregate returns; Individual cross sectional regressions	Size-adjusted returns, Additional regression factors; CAPM-beta, size, book-to-market, leverage, earnings-price-ratio	3 months	Returns 12-60 months; cross sectional 12 months
Skogsvik 2002	Accounting ratios, ROE prediction	Swedish companies, 1982-1990	Portfolio buy and hold returns; market adjusted hedge returns; Jensen's alpha with CAPM; T-test	Perfect foresight	4 months	36 months
This study	Conservative reserves, Unbiased ROE	Swedish companies, 2004-2018	Market adjusted buy and hold return, hedge portfolio, Jensen's alpha	Fama & French 3-factor, Perfect foresight,	5 months	12, 24, 36 months

2.4. Contribution

Previous literature on conservative accounting leans towards theoretical considerations on accounting figures and valuation (Skogsvik 1998, Zhang 2000, Beaver and Ryan 2000), as opposed to empirical observations. Runsten (1998) estimates the level of the permanent measurement bias across various industries that can be expected to persist over time. Penman and Zhang (2002) consider the build-ups and realizations of conservative reserves that create the existence conservative bias, but only do so for LIFO-accounting and intangible assets. This study aims to examine conservative accounting for individual firms a variety of assets over time. Particularly, this study examines how build-ups and realizations of conservative reserves influences the reported profitably of firms.

This thesis aims to evaluate the value relevance of measuring conservative accounting reserves. To accomplish this, stock-picking strategies are formulated which are the basis for creating portfolios that are evaluated in a market setting. This will add additional empirical evidence to the currently limited research body on the value relevance of measuring the degree of conservative accounting (Lev and Sougiannis, 1996; Penman and Zhang, 2002). Likewise, the study also contributes to the wider topic on the value relevance of accounting information in general (Ou and Penman, 1989; Abarbanell and Bushee, 1998; Skogsvik 2002).

In a broader perspective this study contributes to the long-lived debate surrounding the efficient market hypothesis of what information is reflected in security prices. The motivation of the research question aligns itself with the standpoint of Grossman and Stiglitz (1980) and Foster (1979) that the market is less than perfectly efficient to public information, and that market actors get compensation for uncovering additional information in the public space.

3. Methodology

This chapter outlines the methodology applied by the study to evaluate the market's efficiency in respect to conservative accounting. First, the derivation of the central accounting concepts is explained, followed by specifications of the estimation of firm specific conservative reserve ratios. Lastly, it is explained how the study evaluates aforementioned concepts, including the composition of portfolio strategies and statistical analyses.

3.1. Specification of the Unbiased Return on Owners' Equity

As shown by Skogsvik (1998), and explained in section 2.2.2., the steady state sustainable ROE that corresponds to the cost of equity under conservative accounting is a function of the cost of equity, the conservative measurement bias and growth (equation 2.6). Another interpretation is that the steady state sustainable ROE is a function of conservative accounting, growth and the economic return on owners' equity, which in the steady state equals the cost of equity. However, in a setting outside the competitive equilibrium, the economic return on owners' equity does not necessarily equal the cost of equity. Instead, the underlying economic return, in addition to equal to cost of equity, also reflects the NPV from existing investments. This economic return on owners' equity, which has not been influenced by conservative accounting, is henceforth referred to as the unbiased return on owners' equity, or ROE^{UB}, as shown in equation 3.1.

$$ROE_t^{UB} = \rho + \text{Return reflecting NPV from investments}_t \tag{3.1}$$

Thus, outside the steady state, the reported return on owners' equity, or ROE^{B}, can be expressed as a function of ROE^{UB}, the conservative measurement bias and growth. Skogsvik (1998) captures the growth component through the general growth in all assets and liabilities, but as the changes in the conservative reserve may vary outside of the steady state, a more accurate specification is appropriate. What do impact the reported net income and subsequently the return on owners' equity, are the build-ups or realizations of conservative reserves (Penman and Zhang, 2002). Thus, the growth component can be defined as the relative change in the conservative reserve. Logically, investments that are made and accounted for with unbiased accounting do not impact the absolute level of the conservative reserve.

$$CR_t = BV_t^B \times q_t \tag{3.2}$$

$$ROE_t^B = \frac{Net\ Income_t^B}{BV_{t-1}^B} \tag{3.3}$$

$$ROE_t^B = ROE_t^{UB} + q_{t-1}(ROE^{UB} - \frac{\Delta CR_t}{CR_{t-1}}) \tag{3.4}$$

Where

ROE_t^B = Reported book return on owners' equity in period t

ROE_t^{UB} = Economic return on owners' equity in period t

$Net\ Income_t^B$= The reported net income in period t

BV_t^B = The reported book value of owners' equity in period t

q_t = Conservative reserve ratio in period t

CR_t = Value of conservative reserve in period t

Increases of the conservative reserve, such as increasingly expensing R&D, has a negative impact on ROE^B while realization of conservative reserves has a positive impact on ROE^B in that period (Penman and Zhang, 2002). Thus, ROE^B should be interpreted as a function of the ROE^{UB}, the recent level of conservative reserve ratio as well as recent changes in the conservative reserve.

In the steady state, estimation of the permanent measurement bias may be used to obtain the return on owners' equity that is influenced by accounting, as is described in equation 2.6. In preceding periods however, the situation is the opposite as the ROE^B may easily be obtained from financial statements while the ROE^{UB} is unknown as it reflects the economic return on available investment opportunities. Hence, estimating a firm's current conservative reserve ratio and recent build-ups or realizations of conservative reserves, allows for creating an estimate of ROE^{UB} in the most recent reported period.

$$ROE_t^{UB} = \frac{ROE_t^B + q_{t-1}\left(\frac{\Delta CR_t}{CR_{t-1}}\right)}{1 + q_{t-1}} \tag{3.4'}$$

3.2. Trading Strategies

3.2.1. Underlying Valuation Model

Assuming market efficiency on the semi-strong level implies that differences in accounting practices applied by firms have no impact on value. Under conservative accounting, the unrecorded values in book value of owners' equity are offset by higher levels of ROE (Penman, 2013). However, as equation 2.3 shows, for value neutrality to prevail, market participants have to make judgments of the development of ROE^B and the level of conservative accounting that can be expected to persist in a competitive equilibrium (K. Skogsvik, 1998).

In order to evaluate the market's efficiency, the valuation mechanics behind the market's reasoning has to be defined. A common valuation model that considers equity valuation in relation to accounting figures is the RIV model (Penman, 2013).The model expresses firm value as a function of book value of owners' equity and future residual returns ($ROE_t^B - \rho$). Typically, the RIV-model is expressed as a series of potentially fluctuating residual earnings until a truncation point in time (T). After the truncation point, the abnormal returns can be assumed to be growing at a constant rate, which allows for expressing the residual value as a value premium (Equation 3.5).

$$V_0 = BV_0^B + \sum_{t=1}^{T} \frac{BV_{t-1}^B(ROE_t^B - \rho)}{(1+\rho)^t} + \frac{V_T - BV_T^B}{(1+\rho)^T} \tag{3.5}$$

If the model is specified so that the truncation point coincides with the firm entering a competitive equilibrium stage, the final term is equal to zero (Penman, 2013). In such a setting, the application of the model relies on two key assumptions. Firstly, one must estimate a truncation horizon point in time where the book return on owners' equity equals the cost of equity, and secondly one must forecast the behavior of abnormal returns up until the horizon date. For determining the horizon point, a reasonable assumption is that market actors on average make the same assessment, independent of their expectations of the abnormal earnings. A plausible assumption for the market's expectations of abnormal returns is that the ROE follows a one-year martingale process, where the best estimate of ROE for the next year is equal to the most recent figure (Ball and Watts, 1972), shown in equation 3.6.[4] It then linearly converges until the truncation point, where no residual returns exist (equation 3.7).

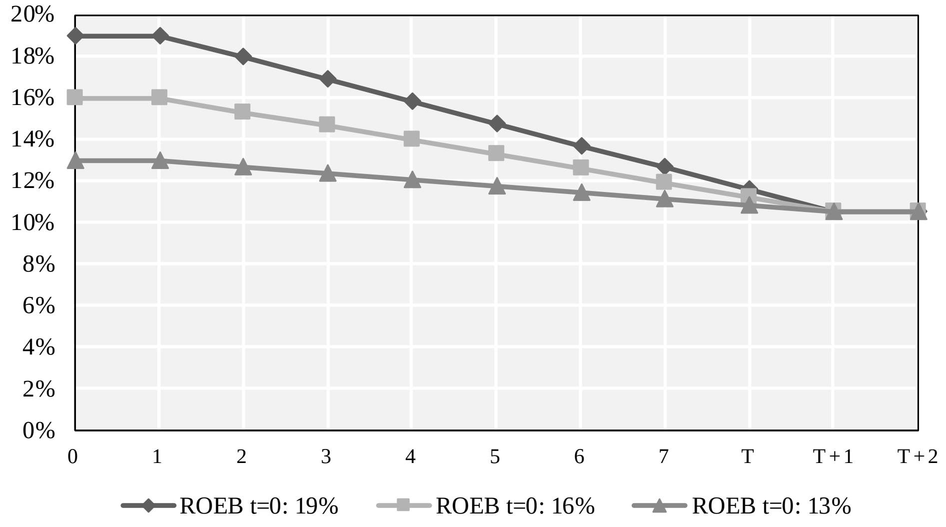
$$E^0(ROE_t^B) = ROE_0^B \tag{3.6}$$

$$E^0(ROE_t^B) = E^0(ROE_1^B) + (t-1) \times \frac{E^0(ROE_{T+1}^B) - E^0(ROE_1^B)}{T} \tag{3.7}$$

Figure 2. shows an illustrative example of the market's expectations of the ROE^B under such conditions. As is shown, a high observed ROE^B in the most recent year, lead to a higher expectation for the first unobserved year and subsequently higher expectations for the entire sequence until the truncation point.

[4] In a martingale process, $E(Y_{t+1}|Y_0,..,Y_t) = Y_t$ for all t (Ball and Watts, 1972)

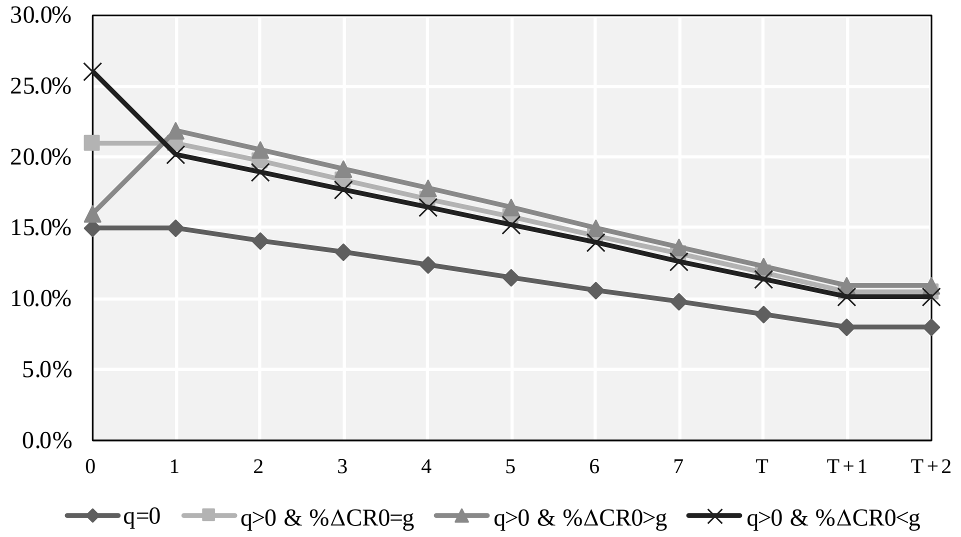
Figure 2. Illustration of the market's expectations of the reported ROE



3.2.2. Stock Picking Strategies

While expecting the next year's ROE to equal the last observed level is reasonable under unbiased accounting it becomes problematic under conservative accounting. Particularly, build-ups and realizations of the conservative reserve yields a significant impact on the reported net income and thus also on ROE^B (Penman and Zhang, 2002). If a firm reports a high ROE which has been positively impacted by releasing a conservative reserve, the firms must continue releasing the same amount of reserves in order to sustain that level of ROE, which is not possible since the reserve eventually depletes. Similarly, if a firm reports a low ROE which has been negatively impacted by a build-up of a conservative reserve, the firms must continuously build-up those reserves in order to sustain the lower level of ROE. Figure 3 shows an illustration of identical companies with identical expectations for ROE^B but with different levels of the change in the conservative reserve in the most recent year.

Figure 3. Illustration of implications of biased ROE estimates



Note: Figure 3 illustrates identic economic conditions. For all the economic growth is assumed to be 3% and q at t=-1is assumed to be 0.5. The only difference is the variation in the growth in the conservative reserve ($\Delta CR_t/CR_{t-1}$) at t=0

Hence, under the one-year martingale assumption, an upwards biased ROE^B will lead to an inflated estimate for $E^0(ROE_1)$, and subsequently the entire abnormal returns sequence. Naturally, the opposite can be assumed for a downwards biased ROE^B.

Strategy 1

With the above market valuation assumptions, the market can be expected to overvalue stocks when ROE^B exceeds ROE^{UB}. Thus, a natural portfolio strategy is to buy stocks when the market underestimates the ROE and sell stocks where the market overestimates the ROE.

- Buy stocks where: $ROE_t^{UB} - ROE_t^B > 0$
- Sell stocks where: $ROE_t^{UB} - ROE_t^B < 0$

Based on the dynamics of the measurement bias in accounting and previous studies, ROE^B can be assumed to be predominantly biased upwards, implying that Strategy 1 would primarily sell stocks.

Strategy 2

An increase in the most recent ROE^B leads to an increase of the entire expectations sequence and thus also the value the market prescribes. However, as ROE^B may change either because of an increase in the underlying economic profitability, i.e. ROE^{UB}, or because of changes in the conservative reserve, a valuation increase may not always be warranted. Hence, investigating the interplay between the changes in ROE^B and ROE^{UB} can illustrate opportunities where the market's reactions are unwarranted. If the increase in ROE^{UB} exceeds the increase in ROE^{B} it implies that accounting has become more conservative and as such the full valuation impact of the increase in ROE^{UB} has been neglected. Based on this logic, the basis for strategy 2 can be formulated as follows:

- Buy stocks where: $\Delta ROE_t^{UB} - \Delta ROE_t^{B} > 0$
- Sell stocks where: $\Delta ROE_t^{UB} - \Delta ROE_t^{B} < 0$

3.2.3. Mispricing and Correction

Obtaining abnormal returns based on a mispricing by the market relies on the mispricing being corrected, where the correcting effect yields the abnormal return. This could occur gradually over time as the market increases its understanding. Another corrective phenomenon suggested by Abarbanell and Bushee (1998) is that the market corrects itself at future information events, such as news articles and earnings reports. A triggering event may also be a change in, or application of new accounting standards.

3.3. Estimating Conservative Reserves

Literature that explicitly considers the conservative measurement bias has been focused on the permanent measurement bias in the steady state environment (Runsten, 1998; K. Skogsvik, 1998). This measure differs fundamentally from the conservative reserve ratio in a recent reported year since build-ups and realizations of conservative reserves may change from year to year. In order to capture such changes, an estimation of the conservative reserve ratio must therefore be done in such a manner that it captures changes that flow through the income statement. This study calculates firm specific conservative reserve ratios for individual years. The methodology largely shares similarities with methods developed by Runsten (1998), who calculated industry-wide permanent measurement biases, but with additional adaptations to suit individual firms and specific points in time. This is done by estimating unbiased values for relevant assets, which are then used to calculate to partial conservative reserve and a firm-wide conservative reserve ratio at a specific point in time.

3.3.1. Unbiased Estimates of Asset Values

In order to estimate the firms' conservative reserves, several adjustments are made for various asset classes. The partial conservative reserve is estimated for the five asset classes that are the most likely to exhibit accounting conservatism: Machinery & Equipment (M&E), Buildings, R&D assets, Inventory and Deferred Income Tax liabilities. Compared to Runsten's study (1998), there are relatively fewer different asset classes to reclassify, as he included asset classes such as Trading Property, Investments in Shares. The reason why Trading Property and Investments in Shares are not considered is simply because real estate companies and financial firms are not included in the sample of companies in this study. Previous studies have also considered intangible assets related to personnel development expenses (Runsten, 1998) and brand investments (Runsten, 1998; Penman and Zhang, 2002), which have not been included in this study. This comes down to an assessment of to what extent those expenses can be viewed as different from an ongoing expense, as well issues in terms of inadequate disclosure. Penman and Zhang (2002) also estimated the effect of LIFO vs FIFO accounting. Since LIFO is no longer allowed under IFRS (IASB, 2003, IAS2 para. 25), such an estimation would be redundant for this study.

Long-lived Depreciable Assets

Long-lived depreciable assets are recorded at historical cost and depreciated over their useful life and includes assets such as M&E and buildings. This method bases their value on a single price level at the acquisition date of the assets, which entails that in inflationary environments both these types of assets will be under-reported versus their current cost, both in terms of their book value as well as their annual depreciation charge. All else equal, the magnitude of the conservative reserve for long-lived depreciable assets is shown to be positively influenced by the historical inflation rate and the age of the asset (Runsten, 1998).

The first step in estimating the unbiased asset value is to estimate the economic life of the asset. This is done by dividing the accumulated acquisition cost of the asset by the corresponding depreciation in that year, which yields the average number of years it takes to fully depreciate the asset (equation 3.8). The second step is to estimate how much of the economic life of the asset that has already elapsed. This is done by deducting the remaining economic life from the total life of the asset (equation 3.9). To derive an unbiased estimate of the asset value, the carrying amount in the balance sheet is adjusted for the change in prices that has elapsed over the estimated age of the asset (equation 3.10).

$$LIFE_{i,j,t} = \frac{Acc\text{umulated } acquisition\ cost_{i,j,t}}{depreciation_{i,j,t}} \tag{3.8}$$

$$AGE_{i,j,t} = LIFE_{i,j,t} - LIFE_{i,j,t} \times \left(\frac{Asset^{B}_{i,j,t}}{Acc\text{umlated } acquisition\ cost_{i,j,t}} \right) \tag{3.9}$$

$$Asset^{UB}_{i,j,t} = Asset^{B}_{i,j,t} \times \frac{Price\ index_{t}}{Price\ index_{t-AGE_{i,j,t}}} \tag{3.10}$$

Where

$LIFE_{i,j,t}$ denotes the estimated economic life of asset *j* for company *i* at time *t*
$AGE_{i,j,t}$ = estimated age of asset *j* for company *i* at time *t*
$Asset^{B}_{i,j,t}$ = carrying value of asset *j* for company *i* at time *t*
$Asset^{UB}_{i,j,t}$ = Estimate of the unbiased value of asset *j* for company *i* at time *t*
$Price\ index_{t}$ = Price index value at time *t*

Research and development

Despite recent changes in accounting standards to increasingly accommodate capitalization of development expenses, a significant part of research and development investments are still expensed, due to issues of measurability and uncertainty of the benefit (IASB, 2020, IAS38 para. 10). Philosophically, research and development can be considered as an investment in a machine, in that the firm invests in an asset in the current period that is expected to produce income over the future period. The reasoning behind to which degree investments in intangibles are either capitalized or expensed relates to the degree of uncertainty regarding the timing, and the size of the expected future benefit of the investment.

The unrecognized reserve related to R&D is estimated by capitalizing previous R&D expenses. Firstly, this requires an assumption of the economic life of the investment, I.e., the duration it is expected to produce a benefit for the firm. Similar to reasonings of Lev and Sougiannis (1996) and Runsten (1998), we assume pharmaceutical companies to on average have a prolonged benefit from R&D investments. The economic life of R&D investments is assumed to be nine years for pharmaceutical companies, and five years for all other firms. The investments are assumed to be held as a balanced portfolio and linearly depreciated over their economic life, equivalent to how long-lived depreciable assets are accounted for. To yield an estimation of the current cost, each expense is adjusted for the changes in prices over the duration the investment has elapsed.

$$Asset_{i,R\&D,t}^{UB} = \sum_{k=0}^{LIFE_i^{R\&D}} EXP_{i,t-k}^{R\&D} \times \left(1 - \frac{k}{LIFE_i^{R\&D}}\right) \times \frac{Price\ index_t}{Price\ index_{t-k}} + Asset_{i,R\&D,t}^{B} \quad (3.11)$$

Where

$Asset_{i,R\&D,t}^{UB}$ = Estimate of the unbiased value of R&D assets for company *i* at time *t*
$Asset_{i,R\&D,t}^{B}$ = Carrying value of R&D assets for company *i* at time *t*
$LIFE_i^{R\&D}$ = Assumed economic life of *R&D investments* for company *i*
$EXP_{i,t}^{R\&D}$ = R&D expense for company *i* in period *t*
k = years elapsed since R&D expense

Tax liability component in long-lived assets

For depreciable assets, the estimates of the unbiased asset values will create a surplus value versus carrying amount that is not tax deductible (IASB, 1979, IAS12 para. 15 & para. 20). Thus, in order to create a fair representation, the unbiased asset value is adjusted for the expected future tax payments. The deferred tax liability component is calculated as the NPV of the non-tax-deductible amount for the incremental depreciation of the surplus value. Similar to how depreciable assets are accounted for, the surplus value is assumed to be depreciated linearly over its remaining life. The annual deferred tax liability equals the value of the non-tax-deductible amount corresponding to each depreciation charge of the surplus value. The deferred tax liability may be deducted from the estimate of the unbiased asset value which allows for handling the entire impact of the surplus value on a single side of the balance sheet.

$$Surplus\ value_{i,j,t} = Asset_{i,j,t}^{UB} - Asset_{i,j,t}^{B} \tag{3.12}$$

$$RL_{i,j,t} = LIFE_{j,t} - AGE_{j,t} \tag{3.13}$$

$$DTL\ component_{i,j,t} = \sum_{t=1}^{RL_{i,j,t}} \frac{\frac{Surplus\ value_{i,j,t}}{RL_{i,j,t}} \times \tau}{\left(1 + r_{d,i}\right)^{RL_{i,j,t}}} \tag{3.14}$$

$$Asset\ net\ of\ DTL_{i,j,t}^{UB} = Asset\ before\ DTL_{i,j,t}^{UB} - \ DTL\ component_{i,j,t} \tag{3.15}$$

Where

$RL_{i,j,t}$ = remaining economic life of asset *j* for company *i* in period *t*

Inventory

Although LIFO accounting is no longer allowed under IFRS (IASB, 2003, IAS2 para. 25), inventory values still tend to be understated. Under historical cost accounting, the recorded value in the balance sheet is equal to the original raw material cost. This implies that any costs incurred to refine the raw material into a finished product available for sale will go unrecorded on the balance sheet. In order to adjust for this conservative bias, the historical cost of inventory needs to be transformed based on the additional cost the firm has attributed to the raw materials.

The first step in adjusting inventory values is to understand the magnitude of the value increase that the firm's production is subject to. Once the markup has been determined, the inventories may be adjusted. A reasonable assumption is that work in process inventory on average incorporates 50 percent of the markup. The unbiased inventory values are thus calculated as follows:

$$MARKUP_{i,t} = \frac{Revenue_{i,t} - COGS_{i,t} - SG\&A_{i,t}}{COGS_{i,t}} \tag{3.16}$$

$$\begin{aligned} Asset_{i,INV,t}^{UB} = {} & Raw\ materials_{i,t}^{B} + Work\ in\ process_{i,t}^{B}\left(1 + \frac{MARKUP_{i,t}}{2}\right) \\ & + Finished\ goods_{t}^{B}\left(1 + MARKUP_{i,t}\right) \end{aligned} \tag{3.17}$$

Where

$MARKUP_{i,t}$ = the gross profit markup of COGS for company *i* at time *t*

$Asset_{i,INV,t}^{UB}$ = Estimate of the unbiased inventory value for company *i* at time *t*

Deferred income tax liability

Another source of measurement bias relates to deferred income tax liabilities, which arise when companies defer recognition of net income in order to defer tax payments. In contrast to measurement biases from asset values where book values underrepresent economic values, the deferred income tax liability is an over-recognition of a liability. Depending on the local tax jurisdiction, deferral of net income may only be done for a finite number of years, after which the net income must be recognized, and corresponding taxes paid. In Sweden, net income can be deferred for a maximum of six years.[5] The measurement bias appears since the liability is recognized at nominal value, although the present value of the liability is lower, as it will be paid out over a period of future years.

The unbiased value is estimated by revaluing the tax liability based on the present value of the future tax payments. The carrying amount in any given year is assumed to be comprised of equally large deferrals made over the maximum number of years that deferral is allowed. The unbiased value is estimated by calculating the NPV of the future reversals of the deferred tax payments.

$$Liability_{i,DIT,t}^{UB} = \sum_{t=1}^{T} \frac{Liability_{i,DIT,t}^{B}/T}{\left(1 + r_{d,i}\right)^{t}} \tag{3.18}$$

Where

$Liability_{i,DIT,t}^{UB}$ = Estimate of the unbiased value of deferred income tax liability for company *i* at time *t*

$Liability_{i,DIT,t}^{B}$ = Book value of deferred income tax liability for company *i* at time *t*

$r_{d,i,t}$ = Cost of debt of company *i* in period *t*

T = Number of years that net income may be deferred

Other estimates considerations

For long-lived depreciable assets and research and development, historical cost entries are converted to current cost. This is done by converting prices based on a producer price index selected for each specific sector. The producer price-indices are based on records from Statistics Sweden (Swedish: SCB).[6] The cost of debt for each firm is primarily estimated by taking the median value of the last three-years' interest expenses over interest bearing debt. When this value is unavailable, it is replaced by the yield on a Swedish investment grade corporate bond index.[7] The corporate tax rate has been estimated by dividing each year's corporate tax expense by profit before tax. When it yields an unreasonable observation (<10% or >40%), the Swedish corporate tax rate in that year has been applied.

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[5] In Sweden companies are allowed to make annual appropriations to a "tax allocation reserve" (periodiseringsfond). Deductions may not exceed 25 percent of pre-tax profit for the year. The reserves must be reversed to taxation within six years of appropriation. (Business Sweden, 2020)

[6] The selected series for each sector are summarized in appendix A

[7] The bond rate used is the S&P Sweden Investment Grade Corporate Bond Index

3.3.2. Conservative Reserve Ratio

The conservative reserve ratio in any given period is calculated by first establishing the conservative reserve ratios for each individual asset. These are then the basis for calculation of partial conservative reserves based on their relative importance, and then aggregated to create the total conservative reserve ratio. For depreciable assets, the asset specific conservative reserve ratio bias is calculated net of the deferred tax liability component. In cases when the reported book value is zero, which is common for R&D assets, the partial conservative reserve may be calculated directly by dividing the surplus value by the owners' equity.

$$q(j)_{i,t} = \frac{Asset_{i,j,t}^{UB}}{Asset_{i,j,t}^{B}} - 1 \tag{3.19}$$

$$MB_{i,j,t} = q(j)_{i,t} \times \frac{Asset_{i,j,t}^{B}}{Owners\ equity_{i,t}} \tag{3.20a}$$

$$MB_{i,j,t} = \frac{Surplus\ value_{i,j,t}^{UB}}{Owners\ equity_{i,t}} \tag{3.20b}$$

$$q_{i,t} = MB_{1,t} + MB_{2,t} + \cdots + MB_{j,t} \tag{3.21}$$

Where

$Asset_{i,j,t}^{B}$ = Carrying value of asset *j* for company *i* at time *t*

$Asset_{i,j,t}^{UB}$ = Estimate of the unbiased value of asset *j* for company *i* at time *t*

$Surplus\ value_{i,j,t} = Asset_{i,j,t}^{UB} - Asset_{i,j,t}^{B}$

$q(j)_{i,t}$ = Conservative reserve ratio of asset *j* for company *i* in period t

$CR_{i,j,t}$ = Partial conservative reserve of asset *j* for company *i* in period t

$q_{i,t}$ = conservative reserve ratio of company *i* in period t

3.4. Portfolio Composition

This study evaluates abnormal returns by composing portfolios based on the strategies formulated in 3.2. The approach differs from previous empirical studies on the relation between conservative accounting reserves and stock prices, where simple average returns are explained by various accounting ratios (Penman and Zhang, 2002; Lev and Sougiannis, 1996). The difference in the return evaluation reflects the constraint on data retrieval for the more complex analysis conducted in this study. In order to evaluate many observations at once, the study combines portfolios over multiple time-periods to create a longer time-series, similar to the method developed by Skogsvik (2002).

The study evaluates trading signals for the fiscal years 2003 to 2014. The entire period is divided into four sub-periods when the strategies will be evaluated, called *trading periods*. Each trading period comprises three *trading opportunities*, when positions may be entered. Consistent with comparable studies, the calendar date for taking positions is set so that it allows enough time for publications of annual reports (Ou and Penman, 1989; Lev and Sougiannis, 1996; Abarbanell and Bushee, 1998; Penman and Zhang, 2002; S. Skogsvik, 2002). The date for taking positions is set to May 1 following the fiscal year that is evaluated. This means that the first trading opportunity occurs in 2004, and the final trading opportunity occurs in 2015. Each buy or sell signal obtained from a strategy at each trading opportunity will be evaluated together by creating portfolios. Trading signals will primarily be evaluated for 36 months. This means that for the final trading opportunity, which corresponds to the fiscal year of 2014, positions will be entered on May 1, 2015 and held for 36 months until April 30, 2018.

3.4.1. Selection criteria

In order to achieve more precision, the study assumes a margin of error in the cut-off value determining the buy or sell signal. If the results are conclusive, the strong signals should give stronger significant results. However, increasing the margin for error also comes with reducing the number of observations. Hence, the basic buy and sell signals are the primary focus in this study. The criteria for buy and sell signals for strategy 1 and strategy 2 are summarized in table 3.

Table 3. Specification of trading signals

Criteria	Basic level	Strong level
Strategy 1		
Buy when $ROE_t^{UB} - ROE_t^{B} >$	1%	3%
Sell when $ROE_t^{UB} - ROE_t^{B} <$	1%	3%
Strategy 2		
Buy when $\Delta ROE_t^{UB} - \Delta ROE_t^{B} >$	1%	3%
Sell when $ROE_t^{UB} - ROE_t^{B} <$	1%	3%

The study also evaluates the buy and sell signals together, as a hedge portfolio. These portfolios consist of a combination of buy positions and sell positions.

3.4.2. Portfolio Returns

The returns of each individual stock and the created portfolio are measured monthly. The underlying stock returns are calculated with reinvested dividends (equation 3.20).

$$r_{i,t} = \frac{S_{i,t} + D_{i,t}}{S_{i,t-1}} - 1 \tag{3.22}$$

Where:

$r_{i,t}$ = return for stock *i* in month *t*

$S_{i,t}$ = Share price for stock *i* in month *t*

$D_{i,t}$ = Dividend for stock i in month t

Similar to Skogsvik's study (2002), positions in each respective portfolio will be weighted according to the so called "Buy and hold" method. This means that a position corresponding to a certain number of shares will be bought or sold at the initial date and then kept until the end of the evaluation. This means that each position's weight in the portfolio may fluctuate as prices vary across the holding period. At the initial date, each stock will be weighted equally (equation 3.23). The monthly return of the portfolio is calculated by first calculating an indexed buy and hold return of the selected stocks in each period (equation 3.24). The monthly return of each portfolio is obtained by calculating the relative change of the index return in each month (equation 3.25).

$$w_{i,str(pos),x,y} = \frac{1}{N_{str(pos),x,y}} \tag{3.23}$$

$$P_{str(pos),x,y,t} = \sum_{i=1}^{N_{str(pos),x,y}} \left(w_{i,str(pos),x,y} \times \prod_{t=1}^{T} (1 + r_{i,t}) \right) \tag{3.24}$$

$$r_{str(pos),x,y,t} = \frac{P_{str(pos),x,y,t}}{P_{str(pos),x,y,t-1}} - 1 \tag{3.25}$$

Where

$w_{i,str(pos),x,y}$ = Initial weight for stock *i* for strategy *str* and signal *(pos)* in period *x* and trading opportunity *y*

$N_{str(pos),x,y}$= Number of stocks with the signal (*pos)* from strategy *str* in trading period *x* and trading opportunity *y*

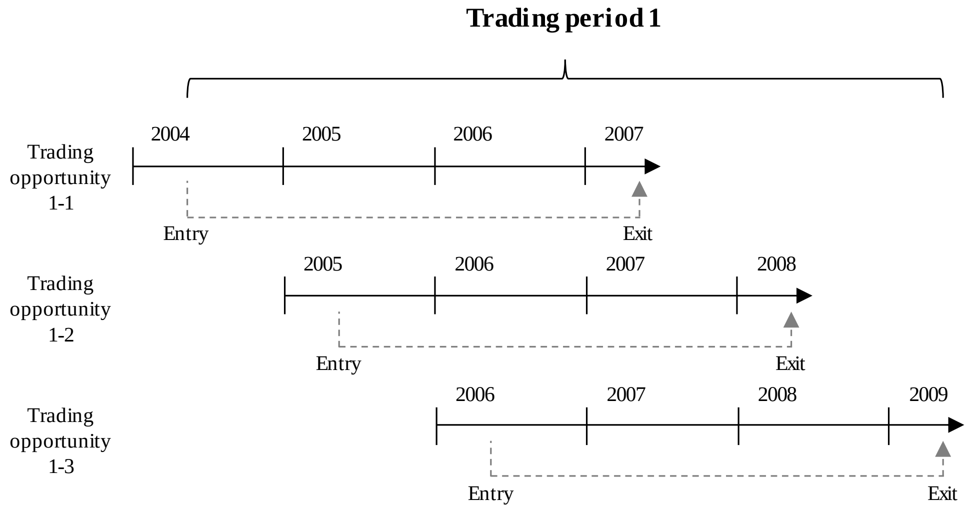
$P_{str(pos),x,y,t}$= Indexed return for portfolio with signal (*pos*) and strategy *str* in trading period *x* and trading opportunity *y* at month *t*

$r_{str(pos),x,y,t}$= Return for portfolio with signal (*pos)* and strategy *str* in period *x* and trading opportunity *y* at month *t*

3.4.3. Trading Period and Study Period

In order to enable evaluation of more observations at once, the returns of three consecutive trading opportunities are aggregated into trading periods. Since positions are evaluated for a period of 36 months, aggregation of consecutive trading opportunities implies that trading periods will overlap. Figure 4 illustrates how consecutive trading opportunities in trading period 1 overlap.

Figure 4. Illustrative example of overlapping evaluation of trading opportunities



The combination of trading opportunities will be made in a similar fashion to weighted based on the number of signals in each trading opportunity For example, this means that if for a specific strategy four buy signals are given in 2005 and seven in 2006, trades taken in 2006 will comprise a larger share of the trading period's return than those taken in 2005. Firstly, the number of stocks that have been included in the underlying trading opportunity portfolios in the month is calculated (equation 3.26). Then, the aggregated price index is calculated by summing the changes in the indexed return of the underlying trading opportunity portfolios based on the number of stocks they hold (equation 3.27). By aggregating based on the absolute changes in the price index, the buy and hold compounding effect is kept also for the longer trading period portfolios. Monthly returns are then obtained by calculating the relative change in the price index for each month (equation 3.28). As the number of stocks with a certain signal only changes once per year, the portfolios are in practice rebalanced once per year (on May 1). For hedge portfolios, the return is calculated by taking the net of the buy and sell return in the period (equation 3.29).

$$N_{str(pos),x,t} = \sum_{y=1}^{3} \left(N_{str(pos),x,y,t}\right) \tag{3.26}$$

$$P_{str(pos),x,t} = P_{str(pos),x,t-1} + \frac{1}{N_{str(pos),x,t}} \times \sum_{y=1}^{3} N_{str(pos),x,y,t} \times \Delta P_{str(pos),x,y,t} \tag{3.27}$$

$$r_{str(pos),x,t} = \frac{P_{str(pos),x,t}}{P_{str(pos),x,t-1}} - 1 \tag{3.28}$$

$$r_{str(hedge),x,t} = r_{str(buy),x,t} - r_{str(sell),x,t} \tag{3.29}$$

Where

$N_{str(pos),x,t}$ = Total number of stocks with strategy *str* and signal *pos* in trading period *x* at month *t*

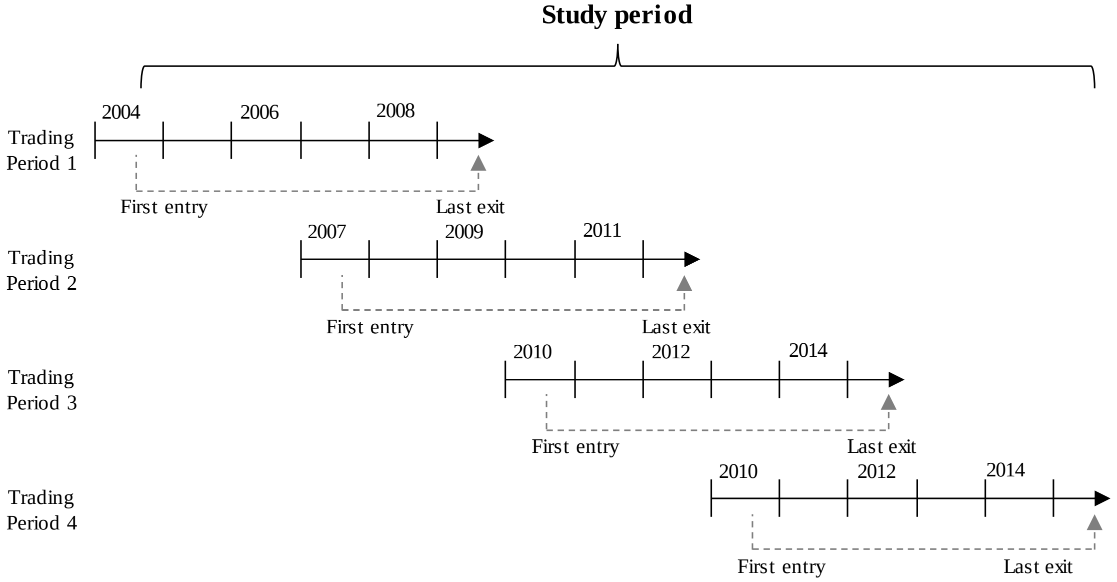
$P_{str(pos),x}$= Indexed return for portfolio with strategy *str* and signal *pos* in period *x* at month *t*

$r_{str(pos),x,t}$= Return for portfolio with strategy *str* and signal *pos* in period *x* at month *t*

$r_{str(hedge),x,t}$= Return for hedge portfolio with strategy *str* in period *x* at month *t*

Equivalently to how trading opportunities are aggregated into trading periods, the trading periods are combined to create a timeseries reflecting the entire study. As figure 5 shows, there are never more than two periods overlapping at once.

Figure 5. Illustrative example of overlapping evaluation of trading opportunities



Note:

The weighting on trading periods will be made based on the number of underlying active positions that make up the trading period in each month. To able the weighting of the trading periods, the number of active positions in the trading periods portfolio in each month is calculated (equation 3.30). The return in the underlying price indices are then combined based on the number of stocks they hold (equation 3.31). Monthly returns are then obtained by calculating the relative change in the price index (equation 3.32).

$$N_{str(pos),t} = \sum_{x=1}^{4} \left(N_{str(pos),x,t}\right) \tag{3.30}$$

$$P_{str(pos),t} = P_{str(pos),t-1} + \frac{1}{N_{str(pos),t}} \times \sum_{x=1}^{4} N_{str(pos),x,t} \times \Delta P_{str(pos),x,t} \tag{3.31}$$

$$r_{str(pos),x,t} = \frac{P_{str(pos),x,t}}{P_{str(pos),x,t-1}} - 1 \tag{3.32}$$

$$r_{str(hedge),t} = r_{str(buy),t} - r_{str(sell),t} \tag{3.33}$$

Where

$N_{str(pos),t}$ = Total number of stocks in strategy *str* signal *pos* and strategy *str* at month *t*

$P_{str(pos),x}$= Indexed return for portfolio with signal *pos* and strategy *str* at month *t*

$r_{str(pos),t}$= Return for portfolio with signal *pos* and strategy *str* at month *t*

$r_{str(hedge),t}$= Return for hedge portfolio with strategy *str* and at month *t*

3.5. Evaluation of Returns

The following section outlines the evaluation of the trading strategies. If not stated otherwise, the study relies on SIX Return Index, commonly known as SIXRX, as the return of the market. SIXRX is a value-weighted index of all stocks listed on the Stockholm Stock Exchange, including reinvested dividends. The one-month Swedish Treasury bill rate is considered the risk-free interest rate.

3.5.1. Market Adjusted Return

The return for the portfolio strategies is evaluated by deducting the market return from the raw return to create a market adjusted return. To allow for easier comparison, the market adjusted return is calculated so that it is expressed as an annualized figure.

$$MAR_{str(pos),x,t} = \left(P_{str(pos),\mathrm{T}}\right)^{\frac{12}{T}} - \left(P_{rm,T}\right)^{\frac{12}{T}} \tag{3.32}$$

$$MAR_{str(hedge),x,t} = MAR_{str(Buy),x,t} - MAR_{str(Sell),x,t} \tag{3.33}$$

Where

$MAR_{str(pos),x,t}$ = Annualized market adjusted return for portfolio with signal *pos* and strategy *str* for month *t*

$P_{str(pos),\mathrm{T}}$ = Indexed return for portfolio with signal *pos* and strategy *str* at the end of the final month

$P_{rm,T} = \prod_{t=1}^{T}\left(1 + r_{m,t}\right)$ = Indexed return for the market at the end of the final month

3.5.2. Three-Factor Model and Jensen's Alpha

As Jensen (1968) describes it, the market is efficient in respect to an information set if it is impossible to gain economic profits by trading on that information set. The abnormal return is defined as the constant that may not be explained by other risk factors. In addition to market return, the study also uses the value premium and size premium, which together comprise the Fama and French three-factor model (Fama and French, 1993). Consistent with the market return, the additional risk factors are based on Swedish firms. Equation 3.34 shows the statistical model that serves as the primary basis for evaluation in the study.

$$r_{str} - rf_t = \alpha_{str} + \beta_{MKT} \times MKT_t + \beta_{HML} \times HML_t + \beta_{SMB} \times SMB_t + \varepsilon_t \tag{3.34}$$

Where

$r_{str} - rf_t$ = return adjusted for the risk-free interest rate for the evaluated portfolio

rf_t = The monthly risk-free rate in month t

α_{str} = statistically estimated monthly abnormal return

$MKT_t = (r_{m,t} - r_{f,t})$ = market risk premium for month *t*

HML_t = Returns for high B/P stocks minus low B/P stocks for month *t*

SMB_t= Returns for low market cap stocks minus high market cap stocks for month *t*

β_{MKT} = Estimated coefficient for the market risk premium

β_{HML} = Estimated coefficient for the book to price premium

β_{SMB}= Estimated coefficient for the small minus big premium

ε_t = Error term for month *t*

The primary objective of the regression analysis is to investigate the existence of a significant abnormal return. Hence, the hypothesis test is formulated as follows:

$$H_0: \alpha_{str} = 0$$

$$H_1: \alpha_{str} \neq 0$$

All regression coefficients as well as the constant, α_{str}, are evaluated through t-tests. A coefficient is considered weak significant, significant, and strongly significant if the t-test yields a p-value of less than 10%, 5% and 1%, respectively. If α_{str} is significantly different from 0, H_0 is rejected and the presence of an abnormal return can be assumed. R^2 -values are included to show the fit of the regression model.

3.5.3. Additional Tests

The study also includes additional robustness tests that aim to increase the validity of the results.

Various Holding Periods

Consistent with previous studies (Ou and Penman, 1989; Abarbanell and Bushee 1998; Penman and Zhang, 2002), the magnitude of the abnormal return will be analyzed across various holding periods after the taking the position. In the existence of abnormal returns, an initial realignment period is expected to occur until a point in time where no additional abnormal returns exist (Ou and Penman, 1989).

Perfect Foresight

In order to validate the relationship between evaluated accounting information and the market's movements, Skogsvik (2002) enters positions with perfect foresight of information. Entering positions before the information has been publicly available adds robustness to the analysis of market efficiency. For a common investor, this trading strategy is completely theoretical, as it implies trading on future information. If the positions taken after the release of information (e.g. May 1) show no abnormal return but positions entered before the release of information do (e.g. January 1), the abnormal market move can be concluded to have occurred in the time span before the release of information or right after the release of the information. Assuming that no movement occurs before release of information, this could either mean that the market reacts efficiently on the day of the release of information, or that it has an inefficient reaction that is corrected quickly.

Table 4. Overview of interpretation of results under perfect foresight

	Perfect foresight, Abnormal return	**Perfect Foresight, No abnormal return**
Ex-post, Abnormal return	The market is inefficient	A movement close to release of information is reversed the period after
Ex-post, No abnormal return	Either the market is efficient (immediate reaction) or the market is inefficient (a quick but not immediate reaction)	The market is efficient

Evaluation of the Sample

In order to evaluate the sample of the study, a portfolio including the entire sample is evaluated with the three-factor model. This gives insight into the return behavior that can be expected in portfolios related to characteristics of the selected sample.

$$r_{sample} - rf_t = \alpha_{sample} + \beta_{MKT} \times MKT_t + \beta_{HML} \times HML_t + \beta_{SMB} \times SMB_t + \varepsilon_t \quad (3.35)$$

Where

α_{sample} = the abnormal return that can be expected due to sample characteristics.

4. Sample

4.1. Sample Criteria

The sample comprises firms listed on the Stockholm main market (OMX Stockholm). The selected period of study for which financial statements are analyzed and trading signals obtained is 2003-2014. This implies that the first trading opportunity occurs in May 2004 and the last trading opportunity in May 2015. Moreover, the 36-month holding period implies that the final trading position will be completed in April 2018. According to the methodology described in the chapter 3, calculations require corporate financial data from 9 years prior to the studied fiscal year for pharmaceutical companies, and 4 years for all other firms. The selection of sample companies is done according to the following criteria:

1) The company is not financial or real estate company according to GICS[8]
2) The company is one of the 50 largest on the OMX Stockholm market, or the company is one of the six largest in its sector, or one of the 16 largest if in the industrial sector
3) The company fulfills criteria 1 and 2 in at least 5 of the 12 fiscal years of study

The first criterion excludes financial and real estate companies as these are subject to substantially different nature of business and accompanying financial reporting, so that to be fairly considered would require a distinct conservative reserve measurement methodology. The second criterion aims to select the most common companies on the stock market while also securing inclusion of companies across various industries. The third criterion is due to data limitation and ensures easing of data retrieval, as it increases the number of observations while it limits the number of individual companies. Notably, the first and third criteria might alter the sample so that it reflects a biased view of the market. This issue is considered in the three-factor model on the entire sample, as explained in 3.5.3.

The analysis as described above relies primarily on detailed accounting data. This includes line items reported in the four statements as well as additional data points disclosed in the notes. Accounting information is obtained from Refinitiv Datastream to the extent it is possible. However, due to the granularity of the data need for the accounting analysis, certain variables are entirely obtained proprietarily from the respective companies' annual reports. Time-series data on sector specific producer prices is obtained from Statistics Sweden (SCB). Market price data are on a company level obtained from Refinitiv Datasream, and the Fama French risk factors including market returns and the risk-free rate, are obtained from Swedish House of Finance's database.

[8] Global Industry Classification Standards; Taxonomy of sectors and industries

4.2. Sample Companies

In total, companies meet the selection criteria in 611 instances across the twelve fiscal years studied. Out of these, a total of 97 observations have been removed leaving 514 observations remaining, which corresponds to 84% of the initial number of observations. The most common reason for exclusion is missing relevant data, which most often relates to disclosures of asset specific depreciation required to estimate an unbiased value for long-lived depreciable assets. The sample is summarized in table 5. All periods except period 2 show relatively stable levels of equity, equity ratio and reported return on owners' equity. Period 2 show a lower equity ratio and higher ROE^B than the other periods. Detailed descriptive information for the sample categorized by year and sector can be found in Appendix B.

Table 5. Overview of sample

Period	**1**	**2**	**3**	**4**	**Entire study**
Fiscal years	2003-2005	2006-2008	2009-2011	2012-2014	2003-2014
First position taken	2004-05-01	2007-05-01	2010-05-01	2013-05-01	2004-05-01
Last position closed	2009-04-30	2012-04-30	2015-04-30	2018-04-30	2018-04-30
Meeting sample criteria	**144**	**165**	**158**	**144**	**611**
Observations not included					
Negative equity	*3*	*3*	*3*	*3*	*12*
	2.1%	*1.8%*	*1.9%*	*2.1%*	*2.0%*
Broken fiscal year	*3*	*3*	*2*	*2*	*10*
	2.1%	*1.8%*	*1.3%*	*1.4%*	*1.6%*
Missing relevant data	*15*	*27*	*23*	*10*	*75*
	10.4%	*16.4%*	*14.6%*	*6.9%*	*12.3%*
Observations included	**123**	**132**	**130**	**129**	**514**
	85.4%	80.0%	82.3%	89.6%	84.1%
Number of companies	43	47	48	46	54
Average frequency same company is included	2.9	2.8	2.7	2.8	9.5
Equity	19.0	21.1	24.5	25.7	22.6
Equity / Assets	45.0%	42.0%	43.9%	43.1%	43.5%
ROE B	17.7%	21.0%	18.3%	16.6%	18.4%

Note: Equity is denoted in billion SEK

4.3. Market Environment

The selected period of study yields open positions from May 2004 to April 2018. As shown in table 6, the study periods show high variation in returns across the 36-month holding period, which is the primary evaluation period for the study. The first and second study periods, which both overlap the global financial crisis, are characterized by large variations in market returns. As could be expected these periods are also subject to higher market volatility. The third and fourth periods show only positive returns on the 36-month level.

Table 6. Overview of trading periods' returns and volatility

Trading Period	**Opportunity**	**Fiscal year**	**Postion date**	**Market return 12m**	**24m**	**36m**	**Market volatility 12m**	**24m**	**36m**
1	**1**	2003	2004-05-01	15%	70%	118%	9%	10%	12%
1	**2**	2004	2005-05-01	48%	90%	52%	10%	13%	16%
1	**3**	2005	2006-05-01	29%	3%	-20%	16%	17%	25%
2	**1**	2006	2007-05-01	-20%	-38%	-10%	16%	27%	24%
2	**2**	2007	2008-05-01	-22%	13%	30%	36%	27%	24%
2	**3**	2008	2009-05-01	45%	67%	55%	12%	13%	16%
3	**1**	2009	2010-05-01	15%	7%	26%	15%	17%	15%
3	**2**	2010	2011-05-01	-7%	10%	33%	19%	16%	14%
3	**3**	2011	2012-05-01	18%	43%	80%	12%	11%	11%
4	**1**	2012	2013-05-01	22%	53%	42%	11%	11%	13%
4	**2**	2013	2014-05-01	26%	17%	46%	11%	14%	13%
4	**3**	2014	2015-05-01	-7%	16%	19%	17%	14%	12%

Note: Market return is defined as the cumulative monthly returns for the specified number of months following the position date. Market volatility is defined as the annualized observed standard deviation in the monthly returns for the specified number of months following the position date.

5. Results

5.1. Accounting Analysis and Trading Signals

Table 7 shows the average conservative reserve ratio (q-value) over time, which appear to be relatively stable, ranging from 0.19 to 0.36. The variation in the q-value is mostly influenced by the variation in the partial conservative reserve related to R&D, which is the largest component of the q-values. Moreover, it can be noted that buildings and deferred income tax have a limited contribution to the q-value. Table 8 shows the average distribution of the conservative reserve ratio across industries. Considering R&D expenses are the biggest component of q-values, it is not surprising to see industries such as Pharmaceuticals (0.79) and IT (0.37) exhibit high q-values. Notably, the Materials sector also shows a relatively high average q-value (0.39), which is likely attributable to a considerable amount of long-lived fixed assets in the sector. This study's estimated conservative reserve ratios are substantially lower than the sector-wide permanent measurement biases (PMB) estimated by Runsten (1998), who estimates an average PMB of approximately 0.61 versus the average conservative reserve ratio of 0.26 in this study. The contrasting results are to some extent expected as the economic environment during 1966-1993, which is the period of Runsten's study, was characterized by higher interest and inflation rates. This particularly affects the current cost values of long-lived assets, which generally appear to be of higher significance for Runsten's values. Another discrepancy is that Runsten's average PMB shows a substantial component of deferred taxes (0.19) as opposed to their limited influence in this study (0.01). This is likely explained by changes in the economic environment, including the substantially higher corporate tax rate and spread versus effective tax rate.[9]

[9] Before the Swedish tax reform in 1990, the statutory corporate tax rate was above 50% but substantial opportunities to deduct and defer tax caused the effective tax rate to be closer to 10%. (Carlgren, 2020)

Table 7. Conservative reserve ratios and partial conservative reserve values by year

	Partial conservative reserve					
Year	**Mchn&Eq**	**Build.**	**R&D**	**Inv.**	**Def. Tax**	**q-value**
2003	0.02	0.01	0.11	0.05	0.00	**0.19**
2004	0.01	0.01	0.11	0.05	0.00	**0.19**
2005	0.02	0.01	0.10	0.05	0.01	**0.19**
2006	0.04	0.01	0.14	0.05	0.01	**0.25**
2007	0.05	0.02	0.16	0.06	0.01	**0.31**
2008	0.09	0.03	0.17	0.06	0.01	**0.36**
2009	0.07	0.03	0.13	0.05	0.01	**0.29**
2010	0.07	0.02	0.13	0.04	0.01	**0.27**
2011	0.06	0.02	0.12	0.05	0.01	**0.25**
2012	0.05	0.02	0.12	0.05	0.01	**0.24**
2013	0.04	0.01	0.23	0.00	0.00	**0.29**
2014	0.04	0.02	0.16	0.03	0.00	**0.25**
All years	**0.04**	**0.02**	**0.16**	**0.04**	**0.01**	**0.26**

Table 8. Conservative reserve ratios and partial conservative reserve values by sector

	Partial conservative reserve					
Year	**Mchn&Eq**	**Build.**	**R&D**	**Inv.**	**Def. Tax**	**q-value**
Com. Svcs.	0.00	0.00	0.02	0.01	0.00	**0.03**
Cons. Disc.	-0.01	-0.01	0.06	0.07	0.00	**0.11**
Cons. Stpl.	0.04	0.01	0.00	0.03	0.01	**0.09**
Energy	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**
Health. other	0.01	0.00	0.15	0.05	0.00	**0.22**
Industrial	0.04	0.02	0.09	0.06	0.00	**0.20**
IT	-0.02	-0.01	0.35	0.06	-0.01	**0.37**
Materials	0.24	0.06	0.03	0.02	0.04	**0.39**
Pharma	0.01	0.01	0.72	0.03	0.02	**0.79**
Utilities	n.a.	n.a.	n.a.	n.a.	n.a.	**n.a.**
All sectors	**0.04**	**0.02**	**0.16**	**0.04**	**0.01**	**0.26**

Table 9 shows ROE^{UB} as well as buy and sell signals for each fiscal year included in the study. ROE^{UB} exceeds ROE^{B} for most years and on average the observed difference is 1.2% in favor of ROE^{B}, which is expected as the sample on average exhibits conservative accounting, i.e. average q-values 0exceeds. Naturally, strategy 1, which sells stocks when ROE^{B} exceeds ROE^{UB}, generates substantially more sell signals than buy signals. However, during the years 2005 to 2008, ROE^{UB} is on average higher, resulting in relatively equal amounts of buy and sell signals for Strategy 1 these years. Strategy 2 on the other hand generates a more balanced distribution of 208 buy signals and 186 sell signals for the entire study period. A similar pattern is shown in the distribution of buy and sell signals within each sector, shown in table 10. Strategy 1 exhibits a material overrepresentation in some sectors, while strategy 2 shows a more even distribution of the signals. For strategy 1, sell signals are particularly overrepresented for the industrial, consumer discretionary, and consumer staples sectors.

Table 9. ROE^{UB} and buy and sell signals by year

	ROE			Strategy 1		Strategy 2	
Year	**B**	**UB**	**Diff.**	**Buy**	**Sell**	**Buy**	**Sell**
2003	15.5%	11.9%	-3.6%	8	20	15	17
2004	17.1%	14.8%	-2.2%	7	25	14	16
2005	20.4%	22.5%	2.0%	14	17	26	10
2006	21.8%	22.1%	0.2%	15	18	18	21
2007	23.4%	24.6%	1.3%	14	15	16	16
2008	18.2%	20.7%	2.5%	19	18	24	14
2009	14.4%	10.5%	-3.8%	8	27	9	22
2010	19.3%	15.1%	-4.1%	5	32	13	25
2011	21.2%	17.1%	-4.1%	2	30	16	13
2012	19.1%	15.4%	-3.7%	1	26	16	14
2013	14.9%	13.3%	-1.6%	5	29	11	15
2014	15.9%	16.5%	0.6%	16	12	30	3
All years	**16.7%**	**15.5%**	**-1.2%**	**114**	**269**	**208**	**186**

Table 10. Unbiased ROE and buy and sell signals by sector

	ROE			Strategy 1		Strategy 2	
Sector	**B**	**UB**	**Diff.**	**Buy**	**Sell**	**Buy**	**Sell**
Com. Svcs.	16.7%	16.5%	-0.2%	9	9	11	13
Cons. Disc.	22.1%	20.1%	-2.0%	5	38	21	18
Cons. Stpl.	22.4%	21.0%	-1.5%	4	15	7	7
Energy	n.a.	n.a.	n.a.	0	0	0	0
Health. other	19.9%	19.0%	-0.8%	5	10	14	8
Industrial	18.6%	16.7%	-1.9%	31	122	86	77
IT	20.9%	17.4%	-3.5%	11	20	16	17
Materials	13.7%	14.6%	0.9%	33	32	36	30
Pharma	16.9%	16.1%	-0.8%	16	23	17	16
Utilities	n.a.	n.a.	n.a.	0	0	0	0
All sectors	**16.7%**	**15.5%**	**-1.2%**	**114**	**269**	**208**	**186**

Table 11 shows the distribution of buy and sell signals across the trading periods, as well as distinguishing the strong signals. Generally, the strong signals show a similar distribution as all the signals. For strategy 1, it should also be noted that the number of strong buy signals in period 2 and period 3 are few, and thus the results in their corresponding periods should be interpreted with caution.

Table 11. Distribution of buy and sell signals by trading periods

	Signal	Strategy 1 All signals	Strong signals	Strategy 2 All signals	Strong signals
Period 1	Buy	29	13	55	29
		23.6%	10.6%	44.7%	23.6%
	Sell	62	32	43	22
		50.4%	26.0%	35.0%	17.9%
Period 2	Buy	48	30	58	32
		36.4%	22.7%	43.9%	24.2%
	Sell	51	26	51	26
		38.6%	19.7%	38.6%	19.7%
Period 3	Buy	15	7	38	20
		11.5%	5.4%	29.2%	15.4%
	Sell	89	56	60	42
		68.5%	43.1%	46.2%	32.3%
Period 4	Buy	22	7	57	31
		17.1%	5.4%	44.2%	24.0%
	Sell	67	37	32	15
		51.9%	28.7%	24.8%	11.6%
Entire period	Buy	114	57	208	112
		22.2%	11.1%	40.5%	21.8%
	Sell	269	151	186	105
		52.3%	29.4%	36.2%	20.4%

5.2. Market Adjusted Returns

Table 12 shows annualized market adjusted returns for each of the periods and portfolio strategies. Strategy 1 shows larger returns for buy signals versus sell signals across all periods, albeit the hedge return is close to zero in period 2 and period 3. Strategy 2 shows more variability with positive hedge returns for period 1 and period 4, and negative hedge returns for period 2 and period 3. The hedge return for strategy 2 across the entire period is positive and of similar magnitude as for strategy 1.

Table 12. Market adjusted returns, annualized

	Portfolio	Strategy 1 All signals	Strong signals	Strategy 2 All signals	Strong signals
Period 1	Buy	2.3%	3.1%	2.3%	-3.4%
	Sell	1.7%	1.2%	7.7%	5.4%
	Hedge	4.0%	4.3%	10.0%	2.1%
Period 2	Buy	1.1%	1.4%	0.0%	2.4%
	Sell	-1.0%	-1.1%	-0.5%	6.8%
	Hedge	0.2%	0.2%	-0.5%	9.2%
Period 3	Buy	1.6%	1.6%	-1.1%	0.6%
	Sell	-1.3%	-1.7%	-3.5%	-4.4%
	Hedge	0.2%	0.0%	-4.6%	-3.8%
Period 4	Buy	2.3%	-7.2%	1.8%	0.9%
	Sell	0.0%	0.0%	-1.5%	-0.2%
	Hedge	2.3%	-7.2%	0.3%	0.7%
Entire period	Buy	0.6%	0.7%	0.4%	-0.1%
	Sell	0.1%	-0.1%	0.2%	0.5%
	Hedge	0.7%	0.7%	0.7%	0.4%

Note: Market adjusted returns are presented on an annualized level and is defined as the return of the portfolio less the corresponding return for the market return ($r-r_m$). Raw returns of each portfolio can be found in Appendix A.

5.3. Three-Factor Model

Table 13 shows the three factor model results for strategy 1. Buy signals exhibit a positive abnormal return for the entire study period. However, the sell signals show a negative abnormal return for the entire study period resulting in no abnormal return for the hedge portfolios. The consistent positive abnormal returns for the buy portfolios coupled with consistent negative abnormal returns for the sell portfolios suggests a potential positive bias in the sample. As such, more weight should be put on the hedge portfolios. The individual periods provide limited additional information with no abnormal returns for hedge portfolios. A positive abnormal return can be found for buy signals in period 1 and negative abnormal returns for sell signals in period 3 and period 4. The strong signals show largely show similar results as when considering all signals.

Table 13. Strategy 1 Three factor model results

	Three factor model				
Strategy 1	**α**	**β_{MKT}**	**β_{SMB}**	**β_{HML}**	**R^2**
Buy - Entire study	**0.339****	**0.487*****	**0.0218**	**-0.0682**	**0.599**
Period 1	0.708**	0.555***	0.089	-0.101	0.605
Period 2	0.407	1.205***	-0.152	0.130	0.686
Period 3	0.693	0.984***	-0.0270	-0.419**	0.630
Period 4	0.136	0.948***	0.324**	0.619***	0.547
Sell - Entire study	**-0.262****	**-0.516*****	**0.0326**	**0.0265**	**0.695**
Period 1	-0.323	-0.614***	0.031	0.020	0.713
Period 2	-0.344	-1.196***	0.203	-0.0447	0.762
Period 3	-0.524*	-0.830***	0.151**	0.0913	0.734
Period 4	-0.397*	-0.832***	0.0615	-0.0392	0.790
Hedge - Entire study	**0.0763**	**-0.0290**	**0.0544***	**-0.0417**	**0.055**
Period 1	0.385	-0.058	0.120*	-0.081	0.148
Period 2	0.0630	0.00920	0.0503	0.0858	0.010
Period 3	0.169	0.155*	0.124*	-0.328**	0.135
Period 4	-0.261	0.116	0.385***	0.580***	0.235
Only strong signals - entire study					
Buy	0.408	0.506***	0.0873	-0.0153	0.340
Sell	-0.297**	-0.478***	0.0107	0.0316	0.646
Hedge	0.111	0.0281	0.0979	0.0163	0.016

* = significant on the 10% level, ** = significant on the 5% level, *** = significant on the 1% level

Table 14 shows the three factor model results for strategy 2. The results for the entire study are similar to those of strategy 1, as buy signals show a positive abnormal return, sell signals a negative abnormal return and the hedge portfolio no abnormal return. The pattern of abnormal returns mimic that of the regression for strategy 1, implying that the analysis of hedge portfolios should be prioritized. Moreover, the trading period results in strategy 2 are somewhat more interesting as the hedge portfolio shows a strong significant positive abnormal return in period 1 and a weak significant negative abnormal return in period 3. Just like for strategy 1, considering only the strong signals for strategy 2 show similar results as for when all the signals are evaluated.

Table 14. Strategy 2 Three factor model results

	Three factor model				
Strategy 2	**α**	**β_{MKT}**	**β_{SMB}**	**β_{HML}**	**R^2**
Buy - Entire study	**0.313****	**0.481*****	**-0.00737**	**-0.0347**	**0.685**
Period 1	0.663**	0.553***	0.047	-0.046	0.719
Period 2	0.189	1.126***	-0.236	0.130	0.707
Period 3	0.234	0.888***	-0.115*	-0.0194	0.732
Period 4	0.522**	0.819***	-0.0526	0.101	0.786
Sell - Entire study	**-0.242***	**-0.553*****	**0.0268**	**0.0179**	**0.707**
Period 1	0.146	-0.670***	0.018	0.036	0.705
Period 2	-0.246	-1.147***	0.189	-0.147	0.736
Period 3	-0.689*	-0.887***	0.106	0.163	0.666
Period 4	-0.547**	-0.824***	0.115	-0.0811	0.725
Hedge - Entire study	**0.0713**	**-0.0717*****	**0.0195**	**-0.0169**	**0.111**
Period 1	0.810***	-0.117***	0.065	-0.010	0.198
Period 2	-0.0570	-0.0212	-0.0473	-0.0175	0.006
Period 3	-0.456*	0.000849	-0.00923	0.143	0.041
Period 4	-0.0256	-0.00576	0.0627	0.0200	0.020
Only strong signals - entire study					
Buy	0.219	0.556***	-0.00705	-0.0323	0.649
Sell	-0.528***	-0.456***	-0.0250	0.0719	0.560
Hedge	-0.220	-0.576***	0.0252	0.0197	0.687

* = significant on the 10% level, ** = significant on the 5% level, *** = significant on the 1% level

While buy signals for both strategies show abnormal returns, those are offset by the negative abnormal returns for sell signals, rendering no presence of abnormal returns in the hedge portfolios. Thus, the results indicate that the conservative accounting analysis conducted in this study may not be used to obtain abnormal returns in the market. A natural interpretation of such a result is that the market is knowledgeable of the presence of conservative reserves and the information can thus not be considered value relevant. This interpretation is contrary to the findings of Lev and Sougiannis (1996) and Penman and Zhang (2002), who show that conservative reserves are value relevant for investors. It could be argued that comparison to those studies is of limited relevance as they only consider R&D reserves (Lev and Sougiannis) and R&D, inventory and brand assets (Penman and Zhang), respectively. However, as the conservative reserve ratio in this study is predominantly related to the partial conservative reserve from R&D, the comparison bears relevance and thus indicates a shift in the market's behavior. On a more generalized level, the results are also contrary to previous findings that fundamental accounting analysis can be used to predict future stock returns (Ou and Penman, 1989; Abarbanell and Bushee, 1998; S. Skogsvik, 2002).

Another potential explanation for the results is that the market is simply unaware of the impacts of conservative accounting and thus never aligns with the economic reality. While this should be considered unlikely, it is perhaps less unlikely to assume a combination of the two, where the market acts efficiently to one component of the conservative reserve bias and inefficiently to another. For example, conservative reserves related to expensed investments in intangible assets is frequently discussed in accounting literature and explicitly considered by standard setters. On the other hand, the mismatch between the historical cost and current cost of long-lived assets receives limited attention from both literature and standard setters. With this perspective in mind, it would not be unreasonable to suggest that the market could act efficiently towards intangible assets but more inefficiently towards long-lived assets.

5.4. Additional Tests

Table 15 shows the results when stocks are held in 12- and 24-month periods, compared to the full 36-month period which is the study’s primary focus. The results generally support the general findings of the study, but a notable difference is that the positive abnormal returns found for buy signals in strategy 1 are non-existent when only evaluated for 12 months. This implies that for these signals, it takes more than 12 months until market correction occurs. A similar occurrence is found in sell signals for strategy 2, where the negative return occurs after 12 months from taking the position.

Table 15. Three factor model results with 12-, 24- and 36-month holding periods

	Three factor model				
	α	**β_{MKT}**	**β_{SMB}**	**β_{HML}**	**R^2**
Strategy 1					
Buy					
12 months	0.185	0.523***	0.0391	0.0363	0.603
24 months	0.309**	0.455***	0.0211	-0.0312	0.579
36 months	0.339**	0.487***	0.0218	-0.0682	0.599
Sell					
12 months	-0.330**	-0.485***	0.0242	-0.0121	0.698
24 months	-0.329***	-0.471***	0.0195	0.0147	0.681
36 months	-0.262**	-0.516***	0.0326	0.0265	0.695
Hedge					
12 months	-0.145	0.0382	0.0632	0.0242	0.025
24 months	-0.0198	-0.0159	0.0406	-0.0164	0.021
36 months	0.0763	-0.0290	0.0544*	-0.0417	0.055
Strategy 2					
Buy					
12 months	0.312**	0.464***	-0.0258	-0.00351	0.680
24 months	0.321***	0.456***	-0.0134	-0.0370	0.647
36 months	0.313**	0.481***	-0.00737	-0.0347	0.685
Sell					
12 months	-0.148	-0.545***	0.0188	-0.0699	0.694
24 months	-0.273**	-0.490***	-0.00978	0.00574	0.699
36 months	-0.242*	-0.553***	0.0268	0.0179	0.707
Hedge					
12 months	0.165	-0.0810***	-0.00700	-0.0734*	0.130
24 months	0.0488	-0.0342*	-0.0232	-0.0312	0.037
36 months	0.0713	-0.0717***	0.0195	-0.0169	0.111

* = significant on the 10% level, ** = significant on the 5% level, *** = significant on the 1% level

A notable difference when positions are taken with perfect foresight is shown in table 16 in that the positive abnormal returns associated with buy positions for strategy 2 disappears. This implies that companies that obtain buy signals in strategy 2, exhibit a relative negative price movement before the reporting date or in the period after publication but before May 1. This is then reversed in the three-year period that follows. A similar movement can be inferred for hedge positions.

Table 16. Three factor model results with perfect foresight

	Fama & French 3 factor				
Weak signals	**α**	**β_{MKT}**	**β_{SMB}**	**β_{HML}**	**R^2**
STRATEGY 1					
Buy					
Main study	0.339**	0.487***	0.0218	-0.0682	0.599
Perfect foresight	0.281*	0.555***	-0.0378	-0.0782	0.661
Sell					
Main study	-0.262**	-0.516***	0.0326	0.0265	0.695
Perfect foresight	-0.238*	-0.513***	0.0822***	0.0227	0.712
Hedge					
Main study	0.0763	-0.0290	0.0544*	-0.0417	0.055
Perfect foresight	0.0428	0.0414	0.0444*	-0.0555	0.036
STRATEGY 2					
Buy					
Main study	0.313**	0.481***	-0.00737	-0.0347	0.685
Perfect foresight	-0.00363	-0.00274	-0.0297***	-0.00389	0.236
Sell					
Main study	-0.242*	-0.553***	0.0268	0.0179	0.707
Perfect foresight	-0.296**	-0.525***	0.0724**	0.0347	0.688
Hedge					
Main study	0.0713	-0.0717***	0.0195	-0.0169	0.111
Perfect foresight	-0.299**	-0.528***	0.0427	0.0308	0.704

* = significant on the 10% level, ** = significant on the 5% level, *** = significant on the 1% level

Table 17 shows the three-factor regression on the entire sample of the study, which provides information about the baseline difference versus the market that can be expected. As indicated by the occurrence of frequent positive abnormal returns for buy portfolios and negative abnormal returns for sell portfolios in our strategies, the entire sample exhibits a positive abnormal return when evaluated versus the market. This reaffirms the notion that the hedge portfolios should be focused on. While this effect in the sample has implications, it is not necessarily unexpected, as the sample entirely excludes financial and real estate firms, which make up a significant part of the market portfolio.

Table 17. Three factor model results of the entire sample

	Fama & French 3 factor				
Sample porfolio	**α**	**β_{MKT}**	**β_{SMB}**	**β_{HML}**	**R^2**
Entire study	**0.289****	**0.494*****	**-0.00962**	**-0.0353**	**0.705**
Period 1	0.483*	0.587***	0.037	-0.053	0.725
Period 2	0.240	1.161***	-0.180	0.113	0.740
Period 3	0.386	0.894***	-0.102	-0.114	0.763
Period 4	0.444**	0.792***	-0.0820	0.0382	0.830

* = significant on the 10% level, ** = significant on the 5% level, *** = significant on the 1% level

6. Discussion

The results in this study suggest that the market's ability to act rationally in presence of conservative accounting should not be underestimated. This is largely a different interpretation than from previous literature on the topic that suggest that the market's knowledge is limited beyond the simplest accounting concepts. With this in mind, the interpretation should not be that either previous studies or this study is inaccurate, but rather that the differences in the results reflect the development of markets over-time. Most of the literature on the topic is published in the 90s and early 2000s and the empirical data used can date back to the 70s (Lev and Sougiannis, 1996; Abarbanell and Bushee, 1998; Penman and Zhang, 2002; S. Skogsvik, 2002). Just as changes in the economic environment can explain the discrepancies between the conservative reserve ratios in this study and the permanent measurement biases calculated by Runsten (1998), changes in the general environment may explain what information is efficiently priced by markets. Today, financial information is made available to anyone almost instantly upon its release, and access to previously released information is no harder to obtain. Assuming investors can be compensated for conducting thorough analysis of financial reports (Grossman and Stiglitz, 1980; Foster, 1979), it is perhaps natural that the bound for which type of information the markets reward moves further away as the availability of information increases. Likewise, the body of research on conservative accounting that was published in the 90s and early 2000s may also have contributed to commoditize such methods of analysis in the hunt for uncovered information. Another plausible explanatory factor is changes in the accounting environment, where standards have become increasingly more comprehensive. One such factor is the introduction of extensive recognition of intangible assets with IAS38 in 2004 (IASB, 2020, IAS38 para. 10), which for many R&D heavy firms allowed for recognizing significant assets on the balance sheet. Moreover, as today's less inflationary environment poses that the difference between current and historic prices are close to negligible, it can be argued that the mismatch between historical and current cost is less of an issue. As such, the assessment of changes in the conservative accounting loses relative importance to other sets of information in attempting to predict the returns of stocks.

The study estimates conservative accounting reserves for Swedish listed firms reporting under IFRS, rendering the findings primarily generalizable for firms operating in similar economic and accounting environments. The estimated levels of conservative reserves and conservative reserve ratios for the observed firms are only accurate to the extent of the asset classes that have been considered in this study. In other words, firms that for example own significant amounts of brand assets, or firms that report material levels of operational leases may not be fairly considered by the conservative reserve ratio calculated in this study. The study also excludes financial and real estate firms, which make up a significant portion of firms in any economy. Furthermore, the findings of the study are limited to its underlying assumptions which might underpin the methodology applied. Particularly, this includes assumptions about the market’s behavior if it is inefficient in respect to conservative accounting, which affects the stock-picking strategies and the subsequent evaluations in the study.

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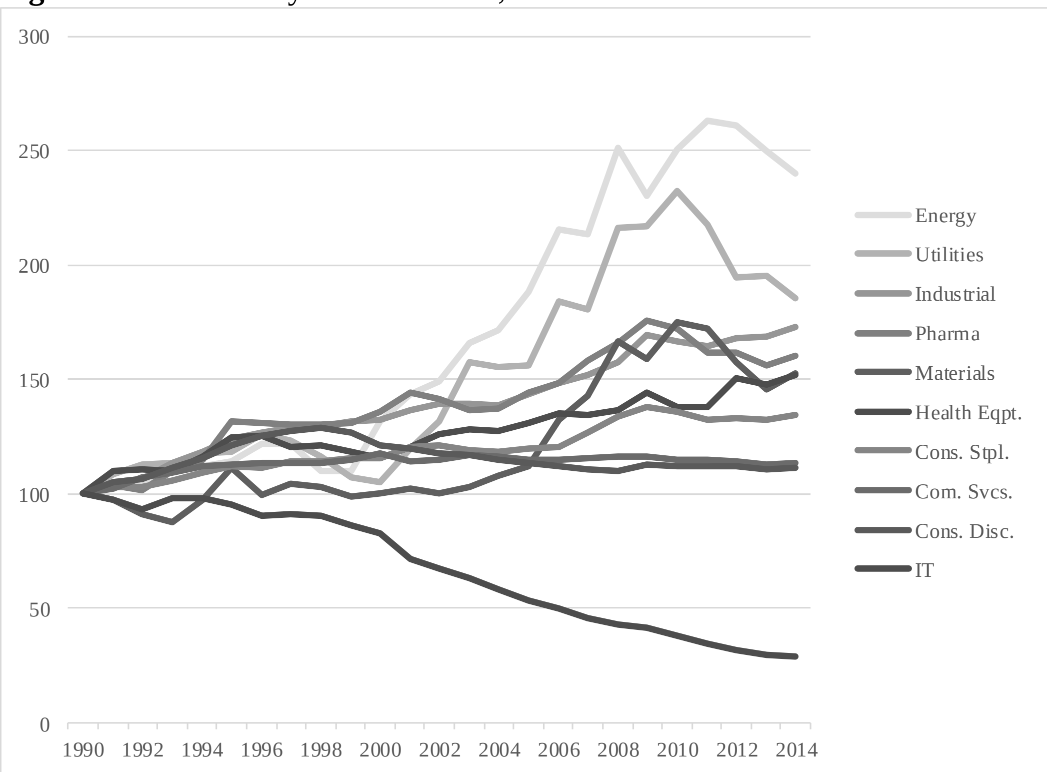
Appendix A – Inflation

Table A1. Summary of producer price indices applies in the study

Sector	Applied producer price series (series code)
Com. Svcs.	Information and communicaiton services (J)
Cons. Disc.	Durable consumer goods (MIG_DCOG)
Cons. Stpl.	Non-durable consumer goods (MIG_NDCOG)
Energy	Energy related goods (MIG_NRG)
Health other	Medicinal and dental equipment (32.)
Industrial	Other machinery (28)
IT	Computerrs, electronic goods and optics (26)
Materials	Average of forrest related products and services (02) and Products from extractions of minerals (B)
Pharma	Chemicals, chemical products and pharmaceutical base products and pharmaceuticals (20-21)
Utilities	Electricity, gas, heating and cooling (D)

Note: Obtained from Statistics Sweden Producer Price Index (PPI) by product group SPIN 2015, Service Price Index (TPI) by service group SPIN 2015.

Figure A1. Inflation by sector indexed,



Appendix B – Additional Descriptive Information

Table B1. Sample companies descriptive information by year

Year	Frequency	Equity	E/A	ROE B
2003	40	17,9	45%	16%
2004	41	18,2	45%	17%
2005	42	20,8	45%	20%
2006	44	20,0	46%	22%
2007	42	21,4	41%	23%
2008	46	21,8	39%	18%
2009	43	23,8	43%	14%
2010	45	24,0	45%	19%
2011	42	25,7	43%	21%
2012	42	25,7	43%	19%
2013	43	25,1	43%	15%
2014	44	26,1	43%	16%
All years	**514**	**23**	**43%**	**18%**

Note: Equity is denoted in billion SEK

Table B2. Sample companies' descriptive information by sector

Sector	Frequency	Equity	E/A	ROE B
Com. Svcs.	43	45	50%	17%
Cons. Disc.	53	16	45%	22%
Cons. Stpl.	25	3	47%	22%
Energy	0	n.a.	n.a.	n.a.
Health Eqpt.	27	8	39%	20%
Industrial	210	17	36%	19%
IT	43	39	51%	21%
Materials	73	21	50%	14%
Pharma	40	43	55%	17%
Utilities	0	n.a.	n.a.	n.a.
All sectors	**514**	**23**	**43%**	**18%**

Note: Healthcare has been disaggregated into Healthcare Equipment and Pharma to reflect the distinct nature of Pharma versus other sectors. When viewed together, the Healthcare sector is of similar size as other sectors

Appendix C – Raw Returns

Table C1. Overview of annualized raw returns by period

		Strategy 1		Strategy 2		Market
	Portfolio	**Weak**	**Strong**	**Weak**	**Strong**	**return**
Period 1	Buy	13,2%	14,0%	13,2%	7,5%	10,9%
	Sell	9,2%	9,7%	3,2%	5,5%	
	Hedge	4,0%	4,3%	10,0%	2,1%	
Period 2	Buy	3,8%	4,0%	2,6%	5,1%	2,7%
	Sell	3,6%	3,8%	3,2%	-4,1%	
	Hedge	0,2%	0,2%	-0,5%	9,2%	
Period 3	Buy	18,1%	18,2%	15,4%	17,1%	16,5%
	Sell	17,9%	18,2%	20,0%	20,9%	
	Hedge	0,2%	0,0%	-4,6%	-3,8%	
Period 4	Buy	17,5%	8,0%	17,0%	16,1%	15,2%
	Sell	15,2%	15,2%	16,7%	15,4%	
	Hedge	2,3%	-7,2%	0,3%	0,7%	
Entire period	Buy	10,3%	10,4%	10,1%	9,6%	9,7%
	Sell	9,6%	9,7%	9,5%	9,2%	
	Hedge	0,7%	0,7%	0,7%	0,4%	